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ABSTRACT

A measure of role-taking skill was administered individually to 12 male and 8 female preschoolers. In addition the children were observed during free play on 30 consecutive school days, and their behaviors were coded according to Parten's social participation categories. Significant negative relationships were found to exist between the role-taking task and the incidence of parallel and onlooker-unoccupied activity. Role-taking skill was positively related to associative play. The results provide correlation support for Piaget's belief that peer interaction leads to a decline of egocentrism in childhood. (Author/JMB)

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Categorization Styles in Older Children and Adolescents

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Abstract

A modified form of Sigel's Styles of Categorization Test was constructed, permitting the independent measurement of Descriptive Part-Whole (DPW), Relational-Contextual (RC), and Categorical-Inferential (CI) categorizations, and was administered to 243 fifth, eighth, and eleventh graders on two occasions. At each grade level, a majority of categorizations were CI in nature, followed by a lower frequency of DPW responses, and a minimal frequency of RC responses. DPW responses of boys exceeded those of girls, and categorization modes were independent of intelligence. Reliable individual preferences for one or more categorization modes were obtained, as well as substantial individual differences in such preferences. Results were discussed in terms of hierarchical cognitive stage theory and a conceptual orientation shift hypothesis.

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Categorization Styles in Older Children and Adolescents¹

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In Kagan, Moss, & Sigel's (1963) research on the classificatory behavior of children in tasks where alternative responses were possible, three distinct styles or modes of categorization were identified - Descriptive Part-Whole (DPW), Relational-Contextual (RC), and Categorical-Inferential (CI) categorizations, and the development of these modes in 6 to 12 year old children was examined. These categorization modes were defined as representing stable individual preferences, with the implication that individuals prefer one or another of these modes in their organization and categorization of information. However, individual categorization preferences and individual differences in these preferences were not explicitly detailed in their samples. In a previous study by the present writer (Davis, 1971) on the categorization styles of older children, adolescents, and young adults, as measured by Sigel's Styles of Categorization Test (SCST-Form A), pronounced individual categorization preferences were not found in a majority of the sample, and furthermore, developmental trends inconsistent with those of Kagan et.al. (1963) were obtained. However, these results were called into question by methodological problems associated with the SCST, problems concerning the discriminatory ability of a number of SCST items, and aspects of the test's scoring procedure. Consequently, the purpose of the present study was twofold: 1) to deal with these measurement problems and to construct an alternative form of the SCST, and 2) to identify preferred styles of categorization and individual differences in these styles in 11 to 17 year

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old children and adolescents. At the outset however, I would like to place categorization styles, or cognitive styles, in broader theoretical perspective, in order to generate theoretically based hypotheses or expectations regarding this mode of functioning in older children and adolescents.

Inhelder & Piaget (1958) have shown that adolescents process information at the highest level of organization available to them, via Formal Operations. In classificatory behavior (Inhelder & Piaget), 1964), this involves the formation of logical classes, with class membership (extension) being determined by a set of common properties (intension), and in which there exists a coordinated and quantitative relationship between the constituent members of the class (class inclusion in a hierarchical structure). In terms of categorization styles, logical classes are most closely manifested in CI categorization, with common class membership and inferred properties serving as the basis for classification. Inhelder & Piaget's research has also indicated that logical classes, made possible by Concrete Operations, are immediately preceeded in the Preoperational stage by non-graphic collections, in which single, concrete similarities are centered upon and serve as the primary basis for equivalence judgements. In the present scheme, such collections are represented in DPW categorizations. This sub-logical form of classification is itself preceeded in the early part of the Preoperational stage by graphic collections, or Complexes (Vygotsky, 1962), where compelling, intuitive, and arbitrary associations between stimuli, versus similar common properties, dictate classification. RC categorizations are essentially graphic collections or complexes, and as such represent the lowest level of classification behavior in children. Therefore, each of these prelogical classification forms would be expected to decline throughout the middle years of childhood, with relatively low incidences expected in adoles-

cence. The prevalence of DPW and RC categorizations, relative to CI categorizations in preschool children (Sigel, Jarman, & Hanesian, 1967; Davis & Lange, 1973) was consistent with this expectation, as was Oliver & Hornsby's (1966) findings of decreasing frequencies of Perceptual categorizations (DPW) and Complexive Syntactical Structures (RC), and increasing frequencies of Nominal and Functional categorizations (CI) in 6 to 12 year old children. Similar developmental trends for RC and CI categorizations were also obtained by Kagan et.al. (1963); on the other hand, contrary to the decreasing frequency of DPW-like responses obtained by Oliver & Hornsby (1966), and the theoretical expectations of Inhelder & Piaget (1964) regarding non-graphic collections, Kagan et.al. (1963) found increases in DPW categorizations with age. These unexpected developmental increases may have been due, at least in part, to the test stimuli employed in their investigation, i.e. the schematic and incomplete figures of the CST, factors which accentuate past differences and encourage analysis of the physical properties of the stimuli, thereby enhancing the frequency of DPW categorizations. In hierarchical cognitive stage theory, the development of higher order structures, as in Formal Operations, involves the displacement or reintegration of lower level structures, i.e. Preoperational-Concrete Operational processes. Thus, preoperational-concrete operational thought "does not disappear when formal thought arises, but continues to be used in concrete situations where it is adequate or when efforts at solution by formal thought have failed (Kohlberg, 1969, p. 353)." Concrete pictorial stimuli have been found to elicit more Perceptual categorizations than verbal stimuli in school age children (Oliver & Hornsby, 1966) and adolescents (Elkind, Medvene, & Rockway, 1971), findings consistent with the hypothesized conceptual orientation shift from higher to lower hierarchical levels as a function of the representational level of the

stimuli. In terms of the present investigation therefore, adolescents should manifest a distinct preference to categorize stimuli at the highest level of classification available to them, i.e. logical classes, as reflected in CI categorizations. However, concrete pictorial stimuli should enhance the possibility of conceptual orientation shifts to non-graphic LPW collections, i.e. the classificatory mode manifested in the immediately preceding hierarchical stage. The lowest level of classification, i.e. RC graphic collections, should be used infrequently by adolescents, and only when higher level alternatives are exhausted.

The identification of categorization preferences in older children and adolescents requires a reliable and valid measurement technique, and it was to this end that Study 1 was directed.

Study 1

Pictorial figure sorting tasks like Kagan et.al.'s (1963) CST and Sigel's SCST were constructed to identify individual categorization preferences. The primary criterion for the inclusion of items in these tests was that the items allowed for more than one conceptual grouping mode. However, the present writer would argue that the possibility of alternative categorizations is not, in itself, a sufficient criterion for item selection. The purpose of a test is to differentiate between individuals, i.e. to show variation (Ferguson, 1971). If, as in the case of Sigel's SCST, the same items are used to measure three categorizations, they must also discriminate individual differences in each of these modes as well. The ability of Sigel's SCST to meet these requirements was called into question by the previous research of the present writer (Davis, 1971), in which a number of SCST items were found to "pull" or elicit particular categorization responses from individuals in the group, thereby reducing

variance in the scores. On the other hand, while individual SCST items may not discriminate all three categorization modes, the possibility existed that particular items might discriminate one or another categorization mode. Therefore, an alternative test strategy was proposed in the present investigation, one involving the independent measurement of DPW, RC, and CI categorization modes.

Subjects & Procedure - 48 pictorial triad, including 27 original SCST items and 21 new items were administered (via 2 x 2 slides) to a standardization sample of 415 fifth, eighth, and eleventh graders (203 boys; 212 girls).² First responses to each of the 48 items were scored as DPW, RC or CI categorizations.

Item Selection - In test construction, the inclusion of an item into a test is often based on the variance contribution of that item to the total variance of test scores, with those items making the greater contribution included in the test, those making a smaller contribution excluded. The most useful single index of an item's variance contribution is the item-test covariance, a statistic which combines the two primary criteria used to evaluate test items: difficulty value and the internal consistency of test responses. Statistically, item-test covariance has been expressed as $r_{ix}s_i s_x$, where r_{ix} is the point biserial correlation between item scores (i) and test scores (x) and s_i and s_x are the standard deviations of scores on the item and test respectively. Ferguson (1971) demonstrated that,

$$r_{ix}s_i s_x = (\bar{X}_p - \bar{X}_q) pq$$

Thus, the contribution of each item to the total test variance, i.e. item-test covariance, is the difference between the means of those passing ($\bar{X}_p$) and those failing ($\bar{X}_q$) the item, multiplied by the proportion of individuals passing (p) and failing (q) item.

²Instructions: pick 2 of the 3 pictures that are alike or go together in any way and write down your reason.

The variance contribution of each of the 48 items to the total variance of DPW, RC, and CI scores (three independent analyses) was calculated at each of the three grade levels. The criterion for the selection of items to be included in the final form of the test was as follows: items whose variance contribution in a particular categorization mode exceeded the mean value of all items in that mode were acceptable; those whose variance contribution fell below the mean in a particular mode were unacceptable.

A total of 30 items were selected at each grade level, 10 of which discriminated individual differences in DPW categorizations, 10 RC and 10 CI categorizations. Thus for each categorization mode, only those items which contributed a considerable amount of variance, i.e. those with good discriminatory capacity, were included in the final form of the test.

Study 2

Subjects - The modified form of the SCST was administered to a sample of 243 children (115 boys; 128 girls) in grades 5, 8, and 11 in the Arlington School System in Poughkeepsie, N.Y. (Table 1)

Procedure - The 30 items selected in Study 1 for the measurement of DPW, RC, and CI categorization modes at each grade level were arranged in random order (Fisher & Yates, 1963) and administered to groups of about 30 students at a time in their classrooms, by means of 2 x 2 slides. Each item was presented for 40 seconds with the same instructions used in Study 1.

Scoring - First responses to each item were scored as DPW, RC, and CI categorizations. The DPW, RC, and CI scores of each individual included the total number of responses in those categories to the ten items which discriminated them at each grade level. Therefore, the highest score which an individual could receive was 10 in any one category; the lowest score was 0.

Results

Mean DPW, RC, and CI categorizations scores at the 5th, 8th, and 11th grades are presented in Table 2. At each grade level, a majority of categorizations were CI in nature, followed by a lower frequency of DPW responses, and relatively few RC categorizations. t tests for correlated samples (Table 3) indicated that these mean differences were significant at each of the three grade levels. In other words, the stimuli were categorized most frequently at the highest level of classification available to the sample of 11-17 year old children and adolescents, i.e. the logical classes of CI categorizations. However, given the concrete pictorial stimuli of the modified SCST, a moderate frequency of DPW categorizations, or non-graphic collections, were also obtained, a finding consistent with the conceptual orientation shift hypothesis. Furthermore, as expected in hierarchical cognitive stage theory, this shift was from the highest level to the immediately preceeding level in the hierarchy. RC categorizations, representing the lowest level of classificatory behavior, were infrequently used by the 11-17 year old sample. Since the pictorial stimuli permitted, but did not necessarily encourage or require such responses, conceptual orientation shifts to this level in the hierarchy were expected to be relatively rare.

Sex differences in the categorization modes were found for DPW categorizations, with boys DPW responses exceeding those of girls ($F_{1/231} = 3.26$, $p < .06$). This finding was consistent with those of Kagan, Rosman, Day, Albert, & Phillips (1964), and Wallach & Kogan (1965) and has been interpreted as a difference in the disposition to analyze stimuli into component parts. This interpretation received additional support from the pervasive sex differences in perception obtained by Witkin and his associates (1962), with boys and men

exhibiting greater field independence, i.e. greater analysis and articulation of the perceptual field, than girls. However, it should be pointed out that field independence refers to analytical competence or ability, as measured by perceptual tasks requiring stimulus analysis, e.g. Embedded Figures Test, Free responses to pictorial triads, as in the modified SCST, reflect categorization preferences, and not necessarily categorization abilities. The relevance of this distinction was demonstrated by Kagan et.al.'s (1964) finding of an insignificant relationship between DPW categorizations on the CST and the ability of 7-11 year olds to solve EFT ($r = -.27$ with solution time). Furthermore, no sex differences in CI categorizations were found in the present investigation. The latter categorizations certainly require analysis at the outset, in the abstraction of basic commonalities among the stimuli, followed by a synthesis at a symbolic level. Therefore, rather than demonstrating sex differences in analytical tendencies, the present findings indicate that older boys are more oriented to the concrete and manifest properties of their environment than are older girls.

The relationship between IQ and categorization modes was also examined in the present investigation. An AOV comparing the categorization frequencies of Hi IQ and Lo IQ groups (Median Split) yielded no IQ effect. Furthermore, product-moment correlations of .002, -.04, and .001 were found between IQ scores and DPW, RC and CI categorization frequencies. Thus, there is no relationship between IQ and categorization style.

Individual Categorization Preferences - The previous literature on categorization modes has implied that individuals have a preferred way of categorizing information, i.e. a single, dominant preference. Davis (1971) reasoned that such a preference, if it exists, should manifest itself in at least a majority

of categorization responses in any given task. An absolute criterion of 50% in the present study (5 or more responses out of 10 in any one categorization mode) resulted in the identification of preferences in 93% of the sample (Table 4), compared to the 31% figure obtained with Sigel's SCST (Davis, 1971). However, this criterion score was only slightly above the mean for DPW categorizations, and was actually below the mean for CI categorizations at each grade level. (See Table 2) Therefore, rather than imposing an arbitrary absolute criterion across the board in order to identify preferences, it seemed more reasonable to look at individual responses relative to the group distribution of scores in each categorization mode. For example, as shown in Table 4, 92.18% of the individuals scored above the mean in at least one categorization mode, and the responses of 63.70% of the sample exceeded 1 standard deviation above the mean, the latter finding indicating pronounced individual preferences for one or another categorization mode. Although the majority of individuals preferred a single categorization mode with all three criteria, a substantial proportion exhibited multiple preferences as well, with CI and DPW dual preferences predominating. Regarding the latter combination, related research in multiple classification behavior has demonstrated not only that older children and adolescents are able to logically classify stimuli by simultaneously combining two attributes (Inhelder & Piaget, 1964), but also that they are most successful in combining perceptual (DPW) and abstract-inferential (CI) attributes (Parker & Day, 1971).

While on the one hand the figures in Table 4 demonstrate distinct individual preferences, they also indicate individual differences in preferential modes as well. Furthermore, the magnitude of this individual variation was reflected in the Range of categorization scores at the three grade levels - DPW and RC categorizations: 0 - 9 respectively; CI categorizations: 2 - 10. In

terms of the group results (Table 2), the sample clearly preferred CI categorizations. This group preference was reflected in the responses of 122 individuals (50.20%), whose CI responses exceeded their DPW and RC responses (chance expectancies of $33 \frac{1}{3}\%$ for each mode). However, the DPW or RC responses of 82 individuals (33.74%) exceeded their CI responses, and an additional 39 individuals (16.05%) responded equally in two categorization modes (including 10% in CI and DPW categorizations). Thus, the categorizations of 121 individuals (49.79%) in the sample deviated from the group preference in one way or another. Variation was also manifested in the pattern of individual responses - while 89 individuals (36.62%) exhibited the overall group pattern of $CI > DPW > RC$ (chance expectancies of $16 \frac{2}{3}\%$ for each of six possible patterns), 154 individuals (63.37%) manifested an alternative pattern. The most frequently used alternative pattern was $DPW > CI > RC$ by 43 individuals (17.69%). Therefore, although the group preferences for CI categorizations, and the group pattern of responses, i.e. $CI > DPW > RC$ generally characterized the responses of individuals within the group, the figures do indicate substantial individual variation in categorization preferences as well.

Test-Retest Reliability - Four weeks after the initial testing session, the modified form of the SCST was readministered to 214 students in the three grades under the same testing procedure. Test-retest reliability coefficients of .54 ($p < .001$), .65 ($p < .001$), and .55 ($p < .001$) were obtained for DPW, RC, and CI frequencies respectively. Considering the fact that most individuals exhibited a preference for at least one categorization mode (Table 4), an additional and perhaps more meaningful indication of the test's reliability would be the consistency of individuals in their preferences over time. Percentages of agreement between preferences (scores exceeding the mean in any

one mode) in the two testing sessions resulted in overall consistency figures of 70.47%, 70.00%, and 66.02% for DPW, RC, and CI preferences respectively. Consistency in pronounced individual preferences (scores one standard deviation above the mean in any one mode) are reflected in test-retest agreement figures of 50.85% (DPW), 60.34% (RC), and 53.13% (CI).

In conclusion, the modified form of Sigel's SCST constructed in the present investigation provided for the independent measurement of DPW, RC, and CI categorizations in older children and adolescents. This technique was found to discriminate group and individual categorization preferences in fifth, eighth, and eleventh graders (11-17 year olds) which were consistent with the expectations of developmental theory and research for this age group, and in particular, with a hierarchical cognitive stage theory and conceptual orientation shift hypothesis.

References

- Bruner, J. S.; Oliver, R. R.; & Greenfield, P. Studies in cognitive growth, New York: Wiley, 1966.
- Davis, A. J. Cognitive style: methodological and developmental considerations. Child Development, 1971, 42, 1447-1459.
- Davis, A. J. & Lange, G. W. Parent-child communication and the development of categorization styles in preschool children. Child Development, 1973, 44, 624-629.
- Elkind, D.; Medvene, L.; & Rockway, A. Representational level and concept production in children and adolescents. Developmental Psychology, 1970, 2, 85-89.
- Ferguson, G. Statistical analysis in psychology and education. New York: McGraw Hill, 1971.
- Fisher, R. A. & Yates, F. Statistical tables for biological, agricultural, and medical research. (4th ed), Edinburgh: Oliver & Boyd, 1963.
- Inhelder, B. & Piaget, J. The growth of logical thinking from childhood to adolescence. London: Routledge & Kegan Paul, 1958.
- Inhelder, B. & Piaget, J. The early growth of logic in the child. London: Routledge & Kegan Paul, 1964.
- Kagan, J.; Moss, H.; & Sigel, I. Psychological significance of styles of conceptualization. Monographs of Society for Research in Child Development, 1963, 28 (2, Serial No. 86), 73-112.
- Kagan, J.; Rosman, B.; Day, D.; Albert, J.; & Phillips, W. Information processing in the child: significance of analytic and reflective attitudes. Psychological Monographs, 1964, 78 (1, Whole No. 578), 1-37.

- Kohlberg, L. Stage and sequence: the cognitive-developmental approach to socialization. In D. Goslin (Ed.) Handbook of socialization theory and research. Chicago: Rand McNally, 1969.
- Oliver, R. R. & Hornsby, J. R. On equivalence. In J. S. Bruner; R. R. Oliver; & P. M. Greenfield, Studies in cognitive growth. New York: Wiley, 1966.
- Parker, R. & Day, M. The use of perceptual, functional, and abstract attributes in multiple classification. Developmental Psychology, 1971, 5, 312-319.
- Sigel, I.; Jarman, P.; & Hanesian, H. Styles of categorization and their intellectual and personality correlates in young children. Human Development, 1967, 10, 1-17.
- Vygotsky, L. S. Thought and language. Cambridge: M.I.T. Press, 1962.
- Wallach, M. & Kogan, N. Modes of thinking in young children: a study of the creativity-intelligence distinction. New York: Holt, Rinehart, & Winston, 1965.
- Witkin, H. A.; Dyk, R. B.; Faterson, H. D.; Goodenough, D. R.; & Karp, S. A. Psychological differentiation. New York: Wiley, 1962.

Table 1
Age, Sex, and IQ Distributions in the Sample

Grade	Boys	Girls	Total	Age (Years)	IQ	
	N	N	N	$\bar{X}$	$\bar{X}$	SD
5	40	42	82	11.08	108.64	14.01
8	40	43	83	14.06	110.67	14.83
11	35	43	78	17.10	109.82	13.44

Table 2
Mean Frequencies of DPW, RC, and CI Categorizations
at the Fifth, Eighth, and Eleventh Grade Levels

Grade	DPW		RC		CI	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
5	4.66	1.99	2.61	2.05	5.52	1.71
8	4.77	1.74	1.94	1.99	6.10	1.66
11	4.39	1.92	2.69	1.77	5.25	1.92

Table 3
Paired t Test Comparisons Between
DPW, RC, and CI Categorizations

Category	t	df	p
<u>5th Grade</u>			
DPW-CI	2.34	81	<.05
DPW-RC	5.79	81	<.001
RC-CI	8.65	81	<.001
<u>8th Grade</u>			
DPW-CI	5.06	82	<.001
DPW-RC	8.70	82	<.001
RC-CI	12.89	82	<.001
<u>11th Grade</u>			
DPW-CI	2.46	77	<.05
DPW-RC	5.75	77	<.05
RC-CI	7.81	77	<.001

Table 4
Total Number of Individuals Manifesting Preferences
For DPW, RC, and CI Categorization Modes

Categorization Modes	Criteria For Preferences					
	$\geq 50\%$		$\geq \bar{X}$		$\geq 1SD$	
	N	%	N	%	N	%
DPW	33	13.58%	47	19.34%	44	18.12%
RC	11	4.53%	40	16.46	41	16.87%
CI	73	30.04%	38	15.64%	42	17.28%
CI & DPW	84	34.57%	40	16.46%	11	4.53%
Other Pairs	26	10.70%	59	24.28%	17	7.00%
Total	227	93.42%	224	92.18%	155	63.79%